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ECONOMIC AFFAIRS

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## CONTENTS

## ECONOMIC POLICY, ORGANIZATION, AND MANAGEMENT

- Soviets Convert To Daylight Savings Time  
(EKONOMICHESKAYA GAZETA, Nov 80)..... 1

## INVESTMENT, PRICES, BUDGET AND FINANCE

- Financial Control Under New Conditions Discussed  
(T.M. Dmitrenko; FINANSY SSSR, Oct 80)..... 5

## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATIONS

- Central Complex of Planning Estimates of Gosplan  
(V. Kirichenko, et al; PLANOVoyE KHOZYAYSTVO, Oct 80)..... 13

## REGIONAL DEVELOPMENT

- History of Council for Study of the Productive Forces Reviewed  
(PLANOVoyE KHOZYAYSTVO, Oct 80)..... 23

## INTRODUCTION OF NEW TECHNOLOGY

- Measures Expediting New Technological Advances Proposed  
(V. Babak, et al; PLANOVoyE KHOZYAYSTVO, Oct 80)..... 33

## ECONOMIC POLICY, ORGANIZATION, AND MANAGEMENT

### SOVIETS CONVERT TO DAYLIGHT SAVINGS TIME

Moscow EKONOMICHESKAYA GAZETA in Russian No 47, Nov 80 p 24

[Article: "'Summer' Time and Time Zones"]

[Text] Starting in 1981, the hands on the clocks throughout our country will be shifted twice by one hour -- at midnight, 0000 hours, on 1 April they will be moved forward, and at midnight, 0000 hours, on 1 October, they will be moved back. This procedure has been established by the USSR Council of Ministers for the purposes of standardizing the computation of time on the territory of the Soviet Union and increasing the effectiveness of the use and economizing of our country's fuel and energy resources.

Some of the details pertaining to the innovation were discussed in a conversation that an EKONOMICHESKAYA GAZETA correspondent had with Deputy Chairman of the USSR State Commission for Uniform Time and Frequency Standards, V. G. Il'in.

The vast territory of our Motherland extends over eleven time zones (from zone II through XII). The international system has a total of 24 time zones. Within the confines of each, the keeping of time is identical, and there is a one-hour difference between any two adjacent zones.

It should be remembered that since 1930 the Soviet Union has used so-called decree time [time differing from standard time by set decree] (zone time + 1). As long ago as 1919, the boundaries between the zones were defined by a decree that was signed by V. I. Lenin. In 1930 those boundaries were refined. Since that time, tremendous changes have occurred on the map of the Soviet Union. Hundreds of new, modern cities and industrial centers have arisen. Mineral resources have been discovered and placed at the service of the national economy. And there have also been changes in the administrative-territorial division.

As a result it has become necessary to introduce certain refinements also in the boundaries between the time zones.

The USSR State Commission for Uniform Time and Frequency Standards carried out the entire job with a consideration of the proposals and recommendations made by the union and autonomous republics, krais, and oblasts. Simultaneously the Commission



studied the deviations from decree time which had gradually developed during the years. In most instances the deviation lay in the fact that, in individual autonomous republics, autonomous okrugs, krays, and oblasts, in accordance with decisions passed by the local agencies as long ago as prewar days, an "approximation" had been made to Moscow time. For example, Tatar ASSR, Gor'kovskaya and Arkhangel'skaya Oblasts are in time zone III, but currently use zone II time. It turned out that these "deviations" exist in 13 autonomous republics, autonomous okrugs, krays, and oblasts throughout the country. For purposes of restoring the correct boundaries of the time zones, the hands on the clocks there will be shifted one hour back in the autumn not of next year, but, rather, effective 1 October 1982.

That means that, effective 1 October 1981, in Dagestanskaya, Kabardino-Balkarskaya, Kalmytskaya, Mariyskaya, Mordovskaya, Severo-Osetinskaya, Tatarskaya, Udmurtskaya, Checheno-Ingushskaya, and Chuvashskaya ASSR's, as well as Krasnodarskiy and Stavropol'skiy Krays, and Arkhangel'skaya (excluding Nenetskiy Autonomous Okrug), Vladimirskaya, Vologodskaya, Voronezhskaya, Gor'kovskaya, Ivanovskaya, Kostromskaya, Lipetskaya, Penzenskaya, Rostovskaya, Ryazanskaya, Gambovskaya, and Yaroslavskaya Oblasts, the time used will be zone III, that is, one hour will be added to Moscow time. Effective the same date, the time used in Tyumenskaya Oblast will be that of time zone V (Moscow time + 3); and in Evenkiyskiy Autonomous Okrug and Khatangskiy Rayon, Taymyrskiy (Dolgano-Nenetskiy) Autonomous Okrug, zone VII (Moscow time + 5).

The transition to the new zone time will be more complicated on the territory of Komi ASSR and Nenetskiy Autonomous Okrug, Arkhangel'skaya Oblast, which currently are included in time zone IV, but which still use Moscow time, that is, zone II time. Here the transition will occur in two stages: effective 1 October 1981, the time will shift to zone III time (Moscow time + 1), and effective 1 October 1982, to zone IV time (Moscow time + 2). Consequently, in the Komi Republic and Nenetskiy Okrug, the shifting of the hour hands one hour back, that is, the shifting from "summer" time to "winter" time, will occur for the first time on 1 October 1983.

All the proposals pertaining to the optimal conditions for computation of time in the country were first studied by our commission, jointly with the AUCCTU and the interested ministries and departments. Experts in the field of power and transportation, public health workers, and sociologists participated in the study.

What benefit will the national economy derive from the annual shifting to "summer" time -- from 1 April until 1 October?

According to computations which have been made, the more efficient use of the daylight hours, the decrease in the use of nighttime electrical illumination, will make it possible to achieve a saving, on a country-wide scale, of more than 2.5 billion kilowatt-hours of electrical energy a year. That is an extremely substantial benefit.

This is confirmed by the experience in the countries where it has been an annual practice to shift the hour hands to "summer" time. For example, thanks to the

additional daylight hour, Bulgaria saves 150 million kilowatt-hours, and Italy, 540 million kilowatt-hours.

As for people's customary life and everyday conditions, the new method of computing the time will not make any changes. According to physicians, it will correspond to the seasonal changes in the biological rhythms of the human organism. The "extra" hour of daylight will enable people to make better use of their free time.

What about train and air schedules? The schedules will not change, but will retain a "continuous" time, that is, Moscow time. Actually, many of our long-distance trains cross the boundaries of several time zones while en route. An exception is made for suburban electric trains and local trains -- it is more convenient for those passengers to use a schedule based on the zone time.

The long-distance telephone and telegraph offices will continue to operate on Moscow time. Otherwise a telegram that was sent, say, in Leningrad at 1100 hours and received in Vladivostok a quarter of an hour later would be logged there at 1815 hours. The keeping on ship's time at sea will be in accordance with the international system of time zones. But when ships are located in the roadways and in ports, they will use the local time.

The USSR State Commission for Uniform Time and Frequency Standards has been given the responsibility of developing and, prior to 1 February 1981, approving the methodological instructions for conversion to the procedure of computing time on the country's territory. These instructions will contain a description of the boundaries between the time zones plotted on the map, as well as answers to individual questions that have arisen locally.

It is necessary to dwell briefly on the organization of the time service in the Soviet Union. Its smooth operation is of great importance for all branches of the national economy. The high level and uniformity of measurements must be provided.

"Accurate time" is a very widely used expression. The radio regularly broadcasts time-check signals, and their accuracy is hundredths of a second. Geodesists and astronomers use the term "accurate time" as applicable to the signals with errors amounting to thousandths of a second. But metrologists handle billionths of a second.

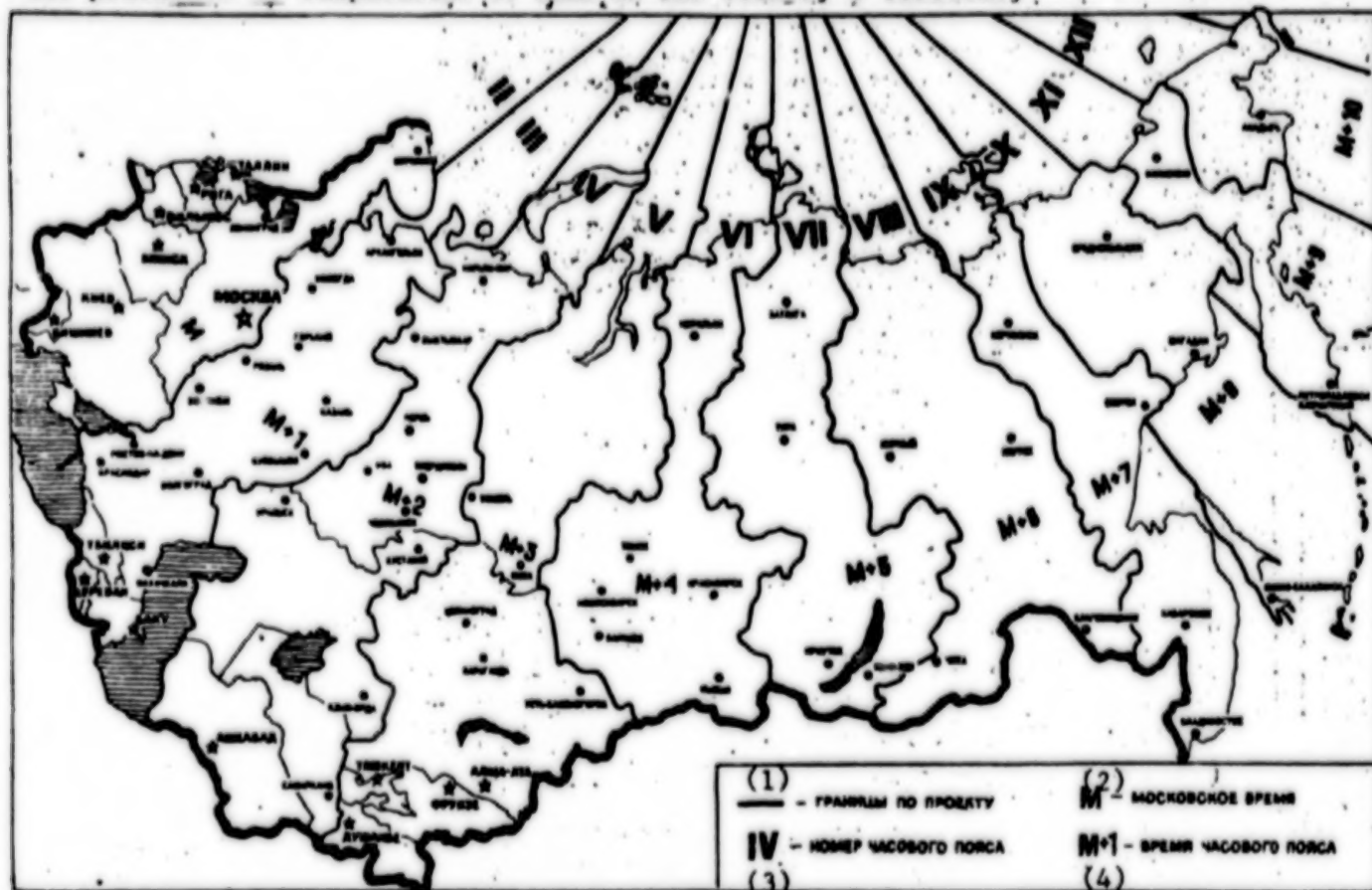
A clock will always serve as a means of measurement. The greatest degree of accuracy must be provided by a standard clock which is used to check all the other clockworks.

The state standard for time and frequency in the Soviet Union has been created and is kept in the All-Union Scientific-Research Institute of Physicotechnical and Radiotechnical Measurements, which is located in the settlement of Mendeleyevo, Moskovskaya Oblast. The main metrological center is located here. It contains the most accurate clock in the country -- the primary standard. A system of "time custodians" is housed in specially equipped areas, on separate foundations, thus making it possible to keep to the minimum the influence exerted upon their

operation by vibration, temperature changes, external magnetic and electrical fields, and other factors.

But just one primary standard is not enough for the entire territory of the country. Therefore, various cities have several secondary standards, which are only slightly less accurate than the main standard. The highly accurate signals that they emit are transmitted by special radio stations.

The USSR State Commission for Uniform Time and Standard Frequencies coordinates the creation and improvement of the systems and means for measuring time, and assures the uniformity of the measurements. Included within the makeup of the commission are responsible representatives of 20 ministries and departments. By governmental decree the commission is given the responsibility of monitoring the procedure of computation of time on the country's territory.



[Key]:

Map of Time Zones

1 - planned boundaries; 2 - Moscow time; 3 - time zone number; 4 - time-zone time.

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## INVESTMENT, PRICES, BUDGET AND FINANCE

### FINANCIAL CONTROL UNDER NEW CONDITIONS DISCUSSED

Moscow FINANSY SSSR in Russian No 10, Oct 80 pp 40-44

[Article by T. M. Dmitrenko, candidate of economic sciences: "Financial Control Under New Conditions"]

[Text] One of the most striking features of the decree of the CPSU Central Committee and USSR Council of Ministers adopted on 12 July 1979 under the title "Improving Planning and Strengthening the Influence of the Economic Mechanism on Raising Production Efficiency and Work Quality" is the all out endeavor to enlarge the personal responsibility of production managers for the work sections entrusted to them and for economical use of physical, labor, and financial resources. The first practical steps in this direction were outlined by the November 1979 Plenum of the CPSU Central Committee: "Control and more control, enhanced by lively organizational work freed of formalism," Comrade L. I. Brezhnev emphasizes, "giving every possible encouragement to the initiative of the working people and holding each employee strictly responsible for the assigned work — these are the key challenges today."<sup>1</sup>

An analysis of the history of our country's economic development leads to the conclusion that without constant, effective work by the enterprise or establishment itself to improve its own finances control measures from outside cannot by themselves straighten the financial system, reporting, or bookkeeping. This is precisely how the question is being posed today. The program outlined for changes in management of the economy demands full responsibility on the part of employees for drawing up and carrying out economically sound plans. The enterprise manager must not share responsibility for the condition of finances with anyone. Experience shows that an excessive gap between the two phases of management, between control and checks on performance and direct organizational activity, has very undesirable consequences.<sup>2</sup> Indeed, combining them is an essential condition for successfully moving ahead.

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<sup>1</sup> PRAVDA 1 December 1979, p 4.

<sup>2</sup> Pel'she, A., "High Standards and Discipline" KOMMUNIST No 2, 1980, p 20.



The reorganization and tightening of control raised first of all the questions of the quality, soundness, and mutual reconciliation of production and financial plans. Preliminary checks on plans are most effective because they promote proportional development of the economy, improved indicators for management activity, fuller identification of production reserves, growth in savings, and elimination of unproductive expenditures and losses. Actual fulfillment of assignments depends on the effectiveness of preliminary checks in the stage of writing plans. Only this kind of control can eliminate the conditions for unsubstantiated revision of the plans themselves where frequent corrections increase the gap between production and financial indicators, which reduces budget income and often leads to additional expenditures of budget capital.

The quality of financial planning in economic sectors today is far from meeting the demands of the day. Financial indicators are sometimes significantly lower than indicators achieved in earlier years; plans for profit, turnover tax, and payments to the budget out of profit are often out of line with basic production indicators.

Audits of budget execution at particular enterprises reveal discrepancies between turnover tax and the production program and planned assortment of output. Sometimes the turnover tax plan is understated because timely adjustments of indicators of production and sale of output are not made. There are also cases where the amounts of turnover tax receipts are overstated because the plan is not supported by a plan for producing the taxed output or is not reduced when the assortment is revised downward owing to lack of markets.

Certain departments and higher-ranking middle-level organizations act in direct detriment to national interests when ratifying plans of payments from profit to the budget for subordinate enterprises by making these payments too high for enterprises that are not fulfilling their savings plans and setting payments to the budget for them that take up a large share of profit. It may even happen that payments to the budget exceed planned profit. In this case the appearance of well-being with fulfillment of the budget for the current year is created but difficulties arise in the next year in connection with recalculations of payments from profit to the budget. Frequently payments are reduced for the first quarters of the year, distributed unevenly over the different periods, and do not correspond to the profit plan overall. In this way expected budget income is in reality used, by means of redistribution within the system, to cover the planned expenditures of enterprises that are working poorly.

The level of financial planning is also lowered by shortcomings in production planning in the sectors, which leads to overstating budget expenditures. Thus, budget appropriations to finance capital investment are often too high because of failure to consider or make correct use of internal resources.

But the need to strengthen preliminary checks on the quality of financial plans cannot be viewed as a problem of non-departmental control alone. It is inconceivable to increase the role of nationwide control without raising demands made of sectorial managers.

It is obvious that broadening initiative "from below" in drawing up the plans of production associations and enterprises shifts the emphasis in review of balances of income and expenditures to lower-ranking financial bodies. Improving control work by the lowest level of the financial system under the new conditions is a problem of paramount importance. It is the local financial agencies that directly supervise financial management. Greater emphasis must be put on preliminary control when drawing up the budget in order to enlarge the responsibility of managers for the soundness of financial indicators and their correct distribution by periods of the year. The transition to a normative system of distributing profit creates the possibility of such a change.

Working out plans on the basis of long-term economic norms changes many things in the formulation of financial control. Stable norms increase accountability for preparing stepped-up plans and efficient use of resources. Expanding the boundaries of redistribution of financial resources internally presupposes a broadening of the functions of internal departmental control of substantiation of the formation and use of monetary capital in the sector.

Stabilization of the norm for deductions from profit that remains at the disposal of industrial ministries, associations, and enterprises will make it possible in large part to free financial agencies from the job of monitoring distribution and use of profit for the internal needs of the sector. A great deal of time and energy is spent today preventing understatement of the free profit remainder because of incorrect determination and use of special-purpose profit that is not distributed within the general system, failure to follow procedures for the formation of economic stimulation funds, incorrect employment of profit to finance capital investment and repay bank loans, use of above-plan profit without a supplementary assignment to replenish a shortage of working capital, and other such activities. Along with an increase in the accountability of ministries and associations for unconditional fulfillment of budget obligations they are assigned the duty of monitoring the correctness and wisdom of profit distribution at subordinate enterprises.

The measures envisioned by the decree to improve planning work provide the economic prerequisites for strengthening control over plans and their fulfillment by both USSR Gosplan and the sectorial ministries and departments. Steps to insure plan balance will prevent many violations of state planning, financial, and report discipline. A balanced plan that takes account of the concrete conditions of development of the association, enterprise, and sector as a whole and closely coordinates income and expenditures, inputs and results, is an important prerequisite for a successful fight against falsification of report indicators, delay in making payments to associated organizations, banks, and the budget, and unproductive and illegal expenditures to pay wages and bonuses.

Control over plan balance is expected to eliminate the situation where even with a shortage of the organization's own working capital this capital is allowed to be diverted to capital construction, capital repair, expenditures not covered by special fund resources and special-purpose financing,

above-norm stocks of commodity-material assets not credited by the bank, and for other needs. At the same time large sums are allocated from the budget to partially cover a shortage of the organization's own working capital; moreover, this shortage may be exaggerated in reports as the result of overstating norms of expenditures for raw and processed materials and other planning defects. When enterprise capital is diverted to unplanned purposes and the question of obtaining the necessary loan at the bank is not decided at the proper time or cannot be decided in the affirmative, enterprises improperly use budget capital for their own internal circulation.

Strengthening control of plan balance at ministries and departments will insure a stable financial situation and improve the payment discipline of associations and enterprises throughout the year. Therefore, enlarging the responsibility of managers for the quality of plans in the sector should be viewed as an essential condition for furthering financial and payment discipline. There are still many cases today where payment defaults are caused by the irresponsible work of bookkeepers who turn in transfer drafts to the bank after the established time of payment. They find themselves in arrears while the enterprises have sufficient money in their current accounts. Sometimes budget payments are not received on time because the higher-ranking bodies fail to deliver payment plans to subordinate organizations on time. Unfortunately, local financial agencies frequently try to use petty overseeing of bookkeepers and financial services instead of demanding high standards from the administration of the payee enterprise.

It should be emphasized that the decree attaches great importance to strengthening control of the quality of plans for economic and social development. The decree plainly requires that ministries and departments insure stability of annual and quarterly plans and not allow adjustments below the actual level of performance. Sanctions are authorized for "tailoring" the plan to the actual situation: the executives of the higher management levels may be subjected to disciplinary action and held materially accountable. The managers of associations, enterprises, and organizations may be deprived, in full or partially but not less than 50 percent, of their bonuses for the primary results of economic activity.

Monitoring performance of this decision is an important job of the financial agencies; they must put the question of punishing guilty parties before higher-ranking organizations at the proper time. Of course, it is far from simple to discern poor planning behind the camouflage of so-called objective factors. But this is an essential condition for effective control and normalization of planning practice.

The stability of wholesale prices in industry for the five-year period is also very important. Above all, this increases the accountability of financial agencies for monitoring the profitability of particular sectors of production by means of the turnover tax. Limiting the possibilities of regulating profitability through prices increases the role of the turnover tax in equalizing conditions and establishing economically correct conditions for management.

There are frequent cases where conditions for collecting the turnover tax are not assured because wholesale prices are ratified at the level of retail



prices minus trade discounts whereas the entire group of commodities should be subject to the turnover tax. Wholesale prices sometimes envision overstated profitability. At the same time, the rights given to the republic ministries of finance and local financial bodies are not being fully used in operational review of questions of regulating conditions for imposing the turnover tax on commodities. Implementation of these rights (differentiating the turnover tax rate) prevents many adjustments in enterprise financial plans and the operational plans of financial agencies.

There are also many shortcomings in ongoing control by local financial agencies of price discipline and correct use of commodity discounts. Evidence of this is seen in the findings of audits of the work of financial agencies related to state income, in particular the material on supplementary turnover tax charges when auditors repeated their inspections.

The jobs of financial agencies in controlling turnover tax deductions are also broadened in connection with steps to stimulate the production of consumer goods. Financial agencies today are not adequately analyzing work by economic organizations to increase the production of consumer goods from waste products. The attention they give to questions of increasing the production of taxable goods and updating their assortment may be bolstered by transferring part of the duties of monitoring profit distribution to other agencies within the department.

It should be observed in passing that under the new conditions the responsibility of internal services for timely and complete transfer of turnover tax to the budget is also increased because favorable conditions are created for timely payment for output delivered to enterprises in conformity with contracts. Even shipping of goods is now more influential in insuring complete receipt of earnings from sale of output. Therefore, checks by enterprise economic divisions on shipment of output to customers will at the same time promote complete and regular payment of turnover tax to the budget.

The important place of financial control in improving the economic mechanism results from the orientation toward growth in socialist savings and the practice of evaluating and giving incentive on the basis of quality indicators and normative net profit. Monitoring reductions in prime cost, the correspondence between incentive and labor expended, and the reliability of report data on production volume and labor productivity is becoming, especially significant.

Increasing the economic interest in raising profit will result, on the one hand, in the creation of the economic prerequisites for eliminating the causes of failure to fulfill profit plans: slow incorporation of projected capacity, overexpenditure of raw materials and wage funds; poor organization of production and material-technical supply; losses of work time; unsatisfactory use of equipment, and the like. These are problems of internal (within the organization and department) control in the national economy. On the other hand, the problem of evening out the economic conditions of activity by particular enterprises and attaining a reliable evaluation of its profit results becomes more difficult, which reformulates the tasks of nationwide financial control.



Analysis of the growth of factors of profit and differentiation of them into those that do and do not depend on the efforts of production collectives is very important. Such an analysis is also needed in connection with expansion of the practice of charging fixed payments for highly profitable types of production output that is produced for a long time.

Whereas questions of controlling the distribution and use of profit under the new conditions may to some degree be "turned over" to internal departmental agencies, the process of forming the mass of profit must be constantly supervised by nondepartmental control agencies. It is very important in monitoring profit to prevent the possible negative impact of evaluating and stimulating work by the indicator of normative net profit.

The results of an experiment conducted at enterprises of 19 ministries before adoption of the resolution show that the effect of this indicator on profit is not single-valued. At first glance it would seem that the indicator of net profit should provide additional stimulation to raise the profitability of output and increase the mass of profit through structural changes. However, more careful analysis does not confirm this outward impression. Modification of the production assortment in the direction of more "profitable" articles is counteracted by the averaging out of profitability norms for all articles at the enterprise. The production of less materials-intensive output results in the formation of less profit because the amount of profit in the wholesale price is shaped with due regard for the cost of materials.

What arouses the greatest fears is that normative net output does not stimulate a decrease in the prime cost of products. The new evaluation index does not take the cost of raw and processed materials into account and therefore it does not reflect a savings of embodied labor. Moreover, the norm of net output will be ratified at the same time as the price for each article and will remain invariable for the entire effective period of the price. If we consider the currently existing decline in the share of profit received from reducing production expenditures, we can see how critical the problem of monitoring reduction in prime cost is.

It is common knowledge that prime cost is often overstated because of overexpenditure and inefficient use of raw and processed materials and fuel, poor organization of their receiving and storage, low efficiency, using good raw materials to make poor-quality and unneeded products, incomplete use of production by-products, and using primary raw materials instead of production by-products. Defects in technology often cause considerable losses of raw material. Outdated expenditure norms that are higher than actual levels are frequently used to figure prime cost.

Several elements of the new economic mechanism will indirectly encourage a decrease in the prime cost of output, for example additional steps to conserve materials combined with a direct interest in fulfilling the profit plan by normative distribution of profit and formation of incentive funds. It is especially important that all sectorial administrative agencies now have such effective tools as assignments to reduce the norm of raw and processed materials expenditure and even assignments to reduce prime cost in certain sectors. However, the ministries were given the right to establish assignments

to reduce prime cost for enterprises back in 1975, and the right is rarely used. The reason, as can be seen from the causes listed above for overexpenditure related to prime cost, are the lack of essential conditions for monitoring prime cost and flaws in the planning, record-keeping, reporting, organization, and methods of economic analysis in this field.

Thus, a fundamental improvement in the organization of control over prime cost demands the joint efforts of all planning, management, and control agencies both within the department and outside it. Agencies of the USSR Ministry of Finance should also make a contribution. In local financial establishments the work of divisions involved with national economic financing and the work of inspection services related to state income, especially when reviewing the balances of incomes and expenditures when drawing up the budget, should be appropriately directed. But it must be remembered here that the principal task of national control continues to be supervising the organization of control and record-keeping within the sector itself.

The elimination of unproductive expenditures and losses is a significant reserve for reducing prime cost today. At some enterprises unproductive losses and expenditures are the primary reason for failure to fulfill the profit plan (the sum of fines and penalties exceeds the profit shortfall). The commissions of the two houses of the USSR Supreme Soviet have often remarked in their findings that eliminating significant losses and unproductive expenditures in industry is a major reserve for increasing production of output, lowering prime cost, and increasing profit and supplementary budget income. The data of audits and examinations made by financial agencies testify that the demands made of economic agencies for working out and taking steps to insure a reduction of unproductive expenditures and losses have declined. The budget takes large losses owing to failure to fulfill plans for delivery of output to customers, failure to supply the requested assortment, and delivery of poor-quality goods. The 12 July 1979 decree sets out concrete measures that can eliminate the conditions that give rise to national economic losses and reduce budget income.

Reduction of prime cost and increasing socialist savings are closely bound up with stimulating labor productivity and conserving labor resources. For this reason, the questions of organizing checks on the formation and use of the wages and material incentive funds are becoming more critical than ever before. As a rule, evaluating work by normative net profit produces faster rates of growth in fund-formation indicators than evaluation by gross (commodity) output. This creates a greater need for financial resources for wages and labor stimulation, but this does not hinder fulfillment of the plan for the assortment of most important types of output. At the present time the amount of the material incentive fund often is not lowered for failure to fulfill the plan of deliveries in the assortment envisioned by contract and correction coefficients are not used for failure to fulfill the plan of labor productivity or counter plans.

The danger of an unfounded increase in the wage fund under the new conditions results from the decrease in the proportion of material expenditures in commodity output. As the proportion of more labor-intensive articles increases and, correspondingly, the proportion of more materials-intensive articles decreases, the problem of supervising increases in wages within the

limits of the increase in labor-intensiveness arises. It is the key question of any type of control of the correspondence between incentive measures and work invested.

Favorable conditions for controlling wages in economic sectors are taking shape as a result of the institution of normative planning procedures for the wages fund. The strengthening of internal departmental control over the formation of incentive funds is a result of the fact that the size of these funds depends on the amount of profit remaining at the disposal of the sector. In addition, violations of established regulations in the formation of the material incentive fund will be precluded by a whole program of steps to improve planning work, refinements in the system for supply and marketing of output, establishment of long-term links between different economic organizations, stimulation of labor productivity and the like.

Therefore, the decree links both the general conditions for organizing control and concrete steps to see that it influences the work of associations and enterprises to the functioning of the financial mechanism of the economic sectors themselves. Under the new conditions this also leads to a restructuring of control over the use of financial resources, a decrease in prime cost and growth in profit, a rise in labor productivity, and an increase in the efficiency of public production as a whole.

This change in the organization of financial control orients the nationwide control of financial agencies primarily to questions of supervising actual fulfillment of governmental decisions.

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## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

### CENTRAL COMPLEX OF PLANNING ESTIMATES OF GOSPLAN

Moscow PLANOVVOYE KHOZYAYSTVO in Russian No 10, Oct 80 pp 59-66

[Article by V. Kirichenko, director of the Scientific Research Institute of Economics attached to USSR Gosplan; F. Klotsvog, chief of a department of the Scientific Research Institute of Economics attached to USSR Gosplan; B. Rayzberg, chief of a laboratory of the Scientific Research Institute of Economics attached to USSR Gosplan, and D. Matsnev, senior research associate of the Scientific Research Institute of Economics attached to USSR Gosplan: "The Central Complex of Planning Estimates Is the Key Unit of the Second Section of the Automated System of Planning Estimates"]

[Text] The present stage of the improvement of the methods, technology and organization of the planning of economic and social development is characterized by the intensification of the processes of adopting economico-mathematical methods and computer technology in planning practice. These processes have acquired new qualitative traits and are becoming more and more of a systems nature owing to the fact that they are aimed at the formation of the automated system of planning estimates of USSR Gosplan and the Gosplans of the union republics, which is being carried out according to uniform methodological principles and by and large coordinated working plans and programs.

As is known, so far the first section of the automated system of planning estimates of USSR Gosplan has been developed and introduced and the new tasks of forming the automated system of planning estimates have been set. In this case the center of gravity of all the work has been gradually shifting from the area of the designing of the system and the pilot introduction of individual problems, which are solved using computers, to the sphere of the extensive comprehensive application in planning practice of economico-mathematical methods and models, which are closely connected in the sum total of planning estimates.

It is envisaged to carry out the development and introduction in planning practice of a central complex of planning estimates of the second section of the automated system of planning estimates of USSR Gosplan, which ensures the multivariant study of the main indicators of the plans of USSR economic and social development. Such a central complex of the system of estimates of the national economic plan should become the key unit of the second section of the automated system of planning estimates, which is being introduced in the practice of compiling plans in USSR Gosplan during the 11th Five-Year Plan.



The organization and accomplishment of the development of the central complex are entrusted to the Scientific Research Institute of Economics attached to USSR Gosplan and to the Main Computer Center of USSR Gosplan, while its introduction in planning practice has been entrusted to the Consolidated Department of Long-Term Planning jointly with other departments of USSR Gosplan.

The main idea of the construction of the central complex of planning estimates consists in the fact that at the present stage of the application of economico-mathematical methods and computer hardware in planning the increase of the systems nature and completeness, the logical and technological continuity of the estimates being made is especially urgent.

Although the scale of the automation of planning estimates in USSR Gosplan is sufficiently great, the introduction of economico-mathematical methods and models and the use of computer hardware are for the present of a local nature and apply to individual economic planning problems or independent planning operations, which are being performed within individual departments. This decreases the effectiveness of the application of economico-mathematical methods and computer hardware in planning practice. Thus, as a result of the work on the development of the first section of the automated system of planning estimates of USSR Gosplan from 1972 to 1977 more than 1,100 economic planning problems, which were solved using computers, were put into operation, while along with the automated systems of planning estimates of the Gosplans of the union republics more than 3,300 were, which constitutes a significant portion of the planning problems, which are liable to solution when drafting the annual and long-term plans of USSR economic and social development.

At present the volume of automated problems, which have been introduced in planning practice, has increased more and more. However, they are being solved mainly independently and are not interconnected, therefore their influence on planning is not of a comprehensive nature. The further increase of the number of problems, which are being solved on computers, without their integration will also not lead, in our opinion, to the automation of the process of drafting plans. There should also be taken into account the real possibilities of a quantitative increase of automated planning estimates, which result from the limitations with respect to the number of specialists engaged in the introduction of the automated system of planning estimates in planning practice, the composition and qualitative level of the available hardware with allowance made for its augmentation.

Under these conditions it seems advisable during the 11th Five-Year Plan to adopt a policy of developing interconnected complexes of automated estimates, which make it possible to arrive at an effective system of estimates before the accomplishment of the complete automation of all the calculating procedures of planning.

The need for the gradual unification of economic planning problems into interconnected aggregates was substantiated back at the initial stage of the designing of the automated system of planning estimates. The idea of creating a central complex of the automated system of planning estimates and the individual means of its practical embodiment were examined in the preliminary design of the automated system of planning estimates. At the present stage of the development of the second section of the automated system of planning estimates it was necessary to formulate more precisely the content and means of realizing this idea.

On the one hand, the central complex is a rather self-contained, relatively independent system of estimates of the main, most important indicators of the sectorial and national economic level. They include the rate of economic growth, the national economic, intersectorial and key intrasectorial proportions, the indicators of the resource backing of the plan, of social development and of the efficiency of social production.

Such a system of balance sheet estimates is of independent importance as a means of the determination, the analysis of the versions and the optimization of the main indicators of the development of the national economy, the achievement of their mutual coordination and balancing in both the physical and the value aspects. The use within the central complex of economico-mathematical models and interdependent direct planning estimates and their realization using high-speed computer equipment will make it possible to increase the scientific validity of the determination of the general indicators of the economic and social development of the country for the future.

On the other hand, the central complex of planning estimates should become the basis of the system of economic planning problems of the automated system of planning estimates, which are being elaborated and introduced in planning practice.

In place of the solution of individual economic planning problems in the first section of the automated system of planning estimates in its second section it is planned to introduce in planning practice their complexes, that is, functionally interacting sets of estimates, which are interconnected with respect to methods and information and are aimed at the solution of the overall planning problem. Such complexes are formed in all the consolidated and sectorial subsystems of the automated system of planning estimates. Their elaboration, experimental checking and introduction constitute the bulk of the operations on the automation of estimates at the stage of the second section of the automated system of planning estimates. However, these complexes are mainly of a subsystem nature, they unite the problems within the individual functional subsystems of the automated system of planning estimates.

For the purpose of carrying out the interconnected estimates of the indicators of the long-term and current plans it is necessary to unite the problems of the consolidated and sectorial subsystems. A special feature of the central complex of planning estimates consists in the fact that in its nature it is an intersubsystem complex, which includes the interconnected problems which ensure the formation of the different sections of the national economic plan.

The central complex of problems of the automated system of planning estimates is aimed at the performance of various functions in the process of drafting plans and has a multiple purpose.

The main characteristics of the different versions of the development of the economy as a whole as a unified system, the rate and general economic proportions, based on the end national economic results, are determined using the estimates of the central complex.

In conformity with the estimates of the central complex the main intersectorial and key intrasectorial proportions of the development of the national economy are formed, the coordination and balancing of the indicators of the development of

sectors and regions, as well as the determination of the consolidated indicators of the plan, the generalization and analysis of the national economic and intersectorial proportions are carried out.

The formulation of the plan with the use of the central complex of problems provides for the making of estimates at the initial stage of the drafting of the long-term plan of economic and social development of the country and the substantiation of the versions of the pattern of ultimate demands, the determination of the potential amounts of manpower resources, the establishment of the indicators of the effectiveness of the use of resources with allowance made for the influence of scientific and technical progress on them. Then these indicators are interconnected in the system of balance sheet estimates, on the basis of which the main indicators of the development of the national economy as a whole and of its sectors and regions are determined. The obtained results are used as reference results for the more detailed and specific estimates of the indicators of the sectorial and territorial breakdowns of the plan, the resource demands and the sources of their satisfaction.

Such a sequence is accomplished in several iterations for the more complete coordination of the resources and the demands of the national economy and of the indicators of the development of the various sectors and regions with the gradual disaggregation of the indicators and estimates.

With allowance made for the functions of the central complex of problems the estimates on the basis of the models of the intersectorial balance, including the consolidated dynamic and detailed physical-value model, are called upon to occupy a key position in its structure. They should be based on the indicators, which were prepared in the consolidated and sectorial departments of USSR Gosplan on the basis of truly operative economico-mathematical models and direct planning estimates.

The formulation of the versions of the rate and proportions of the development of the economy according to the consolidated dynamic model of the intersectorial balance requires a preliminary estimate of the size of the population and the manpower resources, as well as the determination of the amount and structure of the national income, which are accomplished using macroeconomic models and the data of the balance sheet of the national economy.

The changeover from consolidated intersectorial proportions of the development of the economy to the formation of its most rational sectorial structure, which ensures the proportionate and balanced development of all the sectors of the national economy, presumes the substantial broadening of the information base. The corresponding indicators are formed in the consolidated departments of USSR Gosplan, which prepare proposals on the effectiveness of the use of capital investments, manpower and material resources, as well as proposals on the volume, sectorial and commodity structure of the final product. The use of these proposals, as well as of the results of the estimates of the rate and proportions of the development of the economy makes it possible to determine the preliminary version of the mutually balanced system of main physical and value indicators of the development of the national economy with a breakdown by ministries and departments.

The consolidated characteristics of the growth of individual sectors act as target indicators of their development, which have been coordinated and connected with the national economic rate and proportions. The main indicators of the development of the sectors of physical production (the production capacities, the production



volumes, the fixed capital, the capital investments, the labor inputs, the material resources, the production cost) are calculated according to them in the sectorial departments of USSR Gosplan. They are used in the departments of USSR Gosplan when compiling the consolidated plans of the output of products in physical and value terms, the consumption of production resources and others. Proceeding from the proposals of the sectorial departments the estimates of the balanced system of the main indicators of the development of the sectors of the national economy and industry are made on the basis of the physical-value intersectorial balance. The use of these estimates will make it possible to determine the main indicators of the balance of the national economy and to organize definitively the corresponding sections of the draft of the plan.

Thus, the main goal of the creation of the central complex of planning estimates is the computer-assisted realization of the system of interconnected estimates, which includes the estimates of: the needs of the national economy and the sectors of the sphere of material production for material, manpower and financial resources; the material balances of the most important types of products; the balances of manpower resources; the balances of capital investments, fixed capital and production capacities; the plans of the output of products in physical and value terms with a breakdown by sectors and departments; the commodity backing of the retail commodity turnover, the export and import of commodities; the versions of the plan of the optimum development and location of sectors, subsectors and types of works; the consolidated value and detailed physical-value intersectorial balance; the balance of the national economy.

Along with the improvement of the method of planning the creation of the central complex is aimed at the development of the technology and information base of planning estimates by means of the substantial acceleration of the procedures of data processing using computers, the shortening of the time of computing operations, the reduction of the labor-intensity of direct planning estimates, the increase of the variance, accuracy and reliability of the solution of economic planning problems, the increase of the potential of the multiple realization of iterations when coordinating planning decisions.

At the same time the introduction of the central complex in planning practice not only creates the conditions, but also requires the efficient organization of the flows of information both between the economic planning estimates made on computers and between the departments of USSR Gosplan, which use the results of these estimates. This presumes the stricter regulation of the document turnover in planning, which will promote the further improvement of its organization.

In order to realize the central complex it is expedient to include in the functional subsystems of the automated system of planning estimates of USSR Gosplan a sufficiently broad group of interconnected and intercoordinated economic planning problems. Both direct planning estimates and estimates on the basis of the use of economico-mathematical models, the problems of data processing, as well as individual solutions, which are carried out directly by planning workers, belong to them.

Thus, in the subsystem "The Consolidated National Economic Plan" these problems include the determination of the amounts and growth rates of the national income and the gross national product, the formation of the versions of the rate and national economic and sectorial proportions of the development of the economy, the estimates



of the mutually balanced system of the main physical and value indicators of the development of the national economy and of the use of fixed capital and production capacities, the formation of the consolidated plan of industrial production in physical and value terms, the analytical estimates according to the indicators of the balance of the national economy and the formation of a system of the main indicators of the planning balance of the national economy.

The estimates of the indicators of the effectiveness of capital investments and of the limits of the capital investments with a breakdown by sectors and addresses and the formulation of the consolidated plan of capital investments should be among the problems of the consolidated resource balance subsystems, which are included in the central complex of planning estimates. Among the problems of this group of subsystems are the determination of the size and sex-age structure of the population and of the main indicators of the plan on labor and the formulation of the consolidated financial balance of the state. Centralized estimates of the need for the most important types of material resources, alternative estimates of the balances of equipment and the problems of the estimate of the single-product material balances are included in the complex in order to ensure the material balancing of the planned indicators.

Individual estimates, which are made in the multiple functional subsystems of the automated system of planning estimates, should also be a part of the central complex. Among them are the determination of the influence of the main directions of technical progress on the indicators of the effectiveness of the use of production resources and the formulation of the main indicators and measures on the introduction of the achievements of science and technology in the national economy, the estimates of the dynamics and pattern of consumption of the population and the individual consumer budget. These estimates also include the problems of determining the volume and pattern of the foreign trade turnover, the problems of preparing the consolidated plan of foreign economic relations and others.

The estimates of the material expenditures per rule of output, the production cost of the commodity production, the profit from industrial activity, as well as the problems of formulating the rates of consumption (saving) of raw materials and material resources, of estimating the average wholesale prices for industrial products, of determining the directions of the change in the wholesale prices for the output being produced and of elaborating consolidated indicators of the economic and social development of the union republics are among the problems of this group of subsystems.

The problems being solved in the sectorial subsystems are the basis of the central complex. The majority of them are of a standard nature for the 26 subsystems of the sectors of industry. Within the central complex they cover the determination of the need of the national economy for the main types of products, the building of economico-mathematical models of the optimum development and location of the sector, the compilation of the balance of production capacities, the determination of the volumes of output of products in physical and value terms with a breakdown by departments and regions. They also include the estimates of: the effectiveness of the use of fixed production capital; the need for capital investments; the growth rate and level of labor productivity; the amounts of material and technical resources, which are necessary for ensuring the production volumes required by the national economy; the production cost.

An important component of the central complex is the optimization of the development and location of the fuel and power complex, which is being solved in the appropriate complex intersectorial subsystem.

The subsystem "Agriculture" should be represented in the central complex by the estimates of the indicators of the optimum development, location and specialization of agricultural production, the production volumes of the main products of plant growing and animal husbandry, the balance of fodders, the balances of agricultural products, the needs of agriculture for petroleum products, mineral fertilizers and agricultural equipment, the need of agriculture for capital investments, the gross production of agriculture.

The central complex also includes the problems of the subsystem "Transportation." Among them are the estimates of the indicators of the amount of work of transport, the determination of the needs of transportation for fixed capital and capital investments, petroleum products and rolling stock.

For the subsystem "Trade" it is advisable to include in the central complex the problems of determining the resources of market and extramarket funds for the main foodstuffs and nonfood consumer items, as well as the estimates of the provision of the retail commodity turnover with goods.

Thus, according to preliminary estimates, the central complex directly includes approximately 350 economic planning problems (about 50 problems of the consolidated subsystems and approximately 300 problems of the sectorial subsystems), which makes up a relatively small portion of the total number of problems of the second section of the automated system of planning estimates, which are being introduced in planning practice. The enlargement of the composition of the central complex and the increase of the area of its influence on the entire group of planning estimates will make it possible to coordinate the gradually increasing block of problems, which are being introduced in planning practice in the consolidated and sectorial subsystems.

At present at the Scientific Research Institute of Economics attached to USSR Gosplan jointly with the Main Computer Center of USSR Gosplan the composition of the problems of the central complex, which are being solved in the consolidated and sectorial subsystems, has been determined, the general demands on it have been elaborated, the basic scheme of their interrelationship has been drawn up and a draft of the coordinating plan of the development and introduction of the central complex of problems has been compiled.

All the work on the development and introduction in planning practice of the central complex is being carried out as a part of the overall work on the introduction of the second section of the automated system of planning estimates in conformity and close coordination with the development of the support facilities of the second section as a whole.

The central complex is being created mainly from the problems of the first and second sections of the automated system of planning estimates. Since the majority of them were formulated independently in the different subsystems of the automated system of planning estimates, they should be modified for their unification in the central complex. The creation of the latter requires the solution of a number of problems of a methods, informational, mathematical and technological nature, as well as

the improvement of the methods of solving the problems belonging to it for the purpose of developing them into working methods which are suitable for use under the conditions of the automated system of planning estimates.

Taking into account the place of the central complex in the system of the economic planning problems of the automated system of planning estimates, the nature and peculiarities of the interaction of the central complex with the functional subsystems of the automated system of planning estimates, which were not included in it, as well as with departmental and sectorial automated control systems should be determined.

One of the important problems of the methods support of the central complex is the determination of the types of economico-mathematical models, which can be used in it, the concrete expression of their content and the verification of the provision with economic planning input information.

In conformity with the purpose of the central complex of planning estimates all the estimates belonging to it should be combined together in an aggregate whole. Therefore the assurance of their connection, their conjugation according to the "inputs" is one of the most important problems of its construction. Hence arises the problem of the compatibility of the problems, which constitute this complex, without the solution of which it is impossible to achieve their coordination. It is necessary to create the support facilities of the central complex (methods, information and others) with allowance made for the requirements of their coordination in the process of simultaneous solution.

Since the majority of planning problems belonging to the central complex at present have already been elaborated, while some of them have been tested in planning practice, it is expedient to analyze the methods compatibility of them, as well as of the models of the complex and the direct planning estimates. This, in turn, requires the coordination of the methods of solving the problems of the central complex on the basis of a uniform methodology, which stems from the purpose of the complex and its main planning functions. The need to ensure the methods compatibility of the problems of the complex may require their modification, detailing and concrete expression.

The methods compatibility of the problems requires the elaboration of a system of estimate indicators of the central system and their identical interpretation within the various functional subsystems of the automated system of planning estimates, which are united by the central complex. At the same time it is necessary to determine the composition of the input and output information of the central complex, the sources of its formation and the addressees.

An important principle of the creation of the information support of the complex is the realization of the information compatibility of the problems belonging to it.

The development of the software of the central complex of problems requires the necessary algorithms and programs for solving on computer economico-mathematical models and making direct planning estimates. The writing of programs should be carried out in conformity with the prepared methods of solving the problems of the central complex, taking into account the specific nature of the planning estimates and economico-mathematical models, as well as the available information support of the estimates and models.



When developing the software it is necessary to proceed from the creation of the conditions for conducting a dialog of the planning workers with the computer, which issues the results of the solution of the economic planning problems of the central complex. The hardware of the central complex includes the equipment for automating the solution of its problems, its types, the parameters of the necessary computers, the information systems and the office equipment.

The creation of the central complex predetermines the assurance of the calculating and computing compatibility of its problems and the coordination of the main characteristics of the various technical facilities which belong to the automation hardware. Their coordination with the real potentials of the people, who are called upon to interact with these facilities within the complex man-machine system, which operates according to a uniform technological diagram, is also necessary.

After the modification of the problems, which have been introduced in planning practice, and the elaboration of new ones, the achievement of their coordination, and the creation of the necessary components of the methods and information support, the software and the hardware of the problems of the central complex it is planned to carry out their experimental check in the departments of USSR Gosplan and at the Main Computer Center of USSR Gosplan.

The organization of the work on the creation and introduction of the central complex presumes the realization of the following stages.

1. The preliminary stage--until the end of 1980. At this stage the composition and content of the problems of the central complex, the procedure and date of their elaboration are coordinated with the departments of USSR Gosplan, the Main Computer Center of USSR Gosplan, the developing organizations of the plans of the corresponding functional subsystems of the automated system of planning estimates of USSR Gosplan. Moreover, the detailed demands on the information support, the software and hardware of the problems of the central complex are prepared.

2. The elaboration and coordination of the problems of the central complex--1981. At this stage the departments of USSR Gosplan jointly with the developing organizations of the plans of the corresponding functional subsystems determine the specific content organization of each problem, based on the demands made on it, the list of indicators and the forms of the output information and develop the program of the solution of the problems on computer.

On the basis of the basic diagram of the interconnection of the problems of the complex the Scientific Research Institute of Economics of USSR Gosplan and the Main Computer Center of USSR Gosplan draw up the general diagram of the information flows between its problems and work out the technological diagram of its functioning in the planning process. This diagram should determine the order of the calculation of the problems and the information interaction between the departments of USSR Gosplan, between the departments of USSR Gosplan and the corresponding subdepartments of the Main Computer Center of USSR Gosplan, between the subdepartments of the Main Computer Center of USSR Gosplan in the process of solving the problems of the central complex.

At the same time the plans of the support facilities, which are necessary for implementing the central complex, including the formation of its file, the development



of the software of the estimates, the determination of the composition and amount of hardware, the preparation of recommendations on the distribution of the estimates on general-purpose computers and minicomputers, are drawn up. The departments of USSR Gosplan jointly with the developing organizations of the plans of the consolidated and sectorial subsystems of the automated system of planning estimates of USSR Gosplan make an experimental check of the individual problems.

3. The pilot operation of the central complex of problems as a whole--1982. At this stage the consolidated and sectorial departments of USSR Gosplan jointly with the corresponding subdepartments of the Main Computer Center of USSR Gosplan carry out the solution of the problems using the data of the 11th Five-Year Plan.

The Scientific Research Institute of Economics of USSR Gosplan and the Main Computer Center of USSR Gosplan jointly with the Consolidated Department of Long-Term Planning of USSR Gosplan analyze the results obtained on the basis of the solution of these problems and their conformity to the indicators of the approved 11th Five-Year Plan.

4. The introduction and operation of the central complex of problems--1983-1985. During this period its introduction and operation are carried out by the departments of USSR Gosplan and the corresponding subdepartments of the Main Computer Center of USSR Gosplan in the process of drafting the 12th Five-Year Plan.

The development of central complexes of planning estimates within the second section of the automated system of planning estimates with a two-level structure (the automated system of planning estimates of USSR Gosplan and the automated systems of planning estimates of the Gosplans of the union republics) as a means of uniting the central complex of the automated system of planning estimates of USSR Gosplan with the planning estimates of the republic level is an important problem.

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## REGIONAL DEVELOPMENT

### HISTORY OF COUNCIL FOR STUDY OF THE PRODUCTIVE FORCES REVIEWED

Moscow PLANOVYE KHOZYAYSTVO in Russian No 10, Oct 80 pp 88-92

[Unsigned article: "Scientific Center for Work on Problems of Location of the Productive Forces of the USSR"]

[Text] SOPS [Council for Study of the Productive Forces], created under a decision of the USSR Academy of Sciences, held its first session 50 years ago in October 1930. Creation of the new scientific organization in which research on discovery of natural resources and comprehensive development of the productive forces was concentrated, was dictated by the tasks related to carrying out the First Five-Year Plan for Development of the USSR National Economy and the need to do scientific spadework for subsequent 5-year plans.

In all stages of its development SOPS has conducted its activity in close conjunction with a large number of scientific research and project planning organizations and has enlisted the country's most distinguished specialists. I. B. Bardin, N. I. Vavilov, V. I. Vernadskiy, I. M. Gubkin, I. D. Zelinskiy, V. L. Komarov, G. M. Krzhizhanovskiy, V. S. Nemchinov, V. A. Obruchev, S. G. Strumilin, A. Ye. Fersman, L. D. Shevyakov, N. N. Nekrasov, etc., all members of the academy, have at various times taken part in its projects.

At the present time SOPS, which is one of the country's leading scientific institutions, is conducting major research devoted to the methodological and specific problems of the location of the productive forces of the USSR in order to improve the regional organization of the country's economy and to optimize the economic development of the region. There are two distinct periods in the long history of this scientific institution, which has been free from narrow departmentalism and localism and has resolved major problems of locating the productive forces in the interests of the national economy. The first covers the years 1930-1960, when SOPS was subordinate to the USSR Academy of Sciences. In June 1960 SOPS was transferred to the system of planning agencies of the USSR, and the second period of its activity began.

## Scientific Activity of SOPS in the 1930-1960 Period

Creation of SOPS made it possible for the USSR Academy of Sciences to unify efforts of departments and their institutes and organizations and to accumulate extensive material related to evaluation of the potential of the country's various regions and to substantiate strategies for their development.

The period of its activity when the Council for Study of the Productive Forces was subordinate to the academy was characterized mostly by the field-trip method of operation. At that time the country did not possess sufficient materials to characterize the natural potential of the various regions, while at the local level there was still a shortage of skilled scientists capable of doing this work.

In the prewar period SOPS' activity helped to reveal numerous new deposits of a wide variety of natural resources in Siberia, Kazakhstan, the Volga Region, the Urals and the Kola Peninsula and to begin comprehensive study of the factors in development of the productive forces of the union republics and economic regions.

The organization of interdisciplinary field research to study mineral fuels, raw materials and other natural resources and to summarize their results made it possible to work out practical recommendations for commencing economic exploitation of these resources. Over those three decades more than 140 scientific expeditions were made, including the Southern Yenisey Expedition, the Buryat, the Transbaykal, the Pamir, the Yakutia, the Virgin Land Expedition, etc. Extensive use was made of such forms as intersector commissions and scientific conferences on particularly complicated problems. Research was conducted on regionalization of the USSR.

In the thirties field research of the petroleum structures of the Ural-Volga regions and West Siberia was organized, and the natural resources of the Kola Peninsula were studied.

In the years of World War II and the initial postwar period the efforts of SOPS were directed toward the discovery and most rapid development of sources of fuel and mineral raw materials in the Volga Region, the Urals, Siberia, and Kazakhstan, which was important to strengthening the country's defense potential. Field expeditions for comprehensive study of the natural resources of Komi ASSR and the Nenetskiy National Okrug began in 1944. In the first 5-year period following the war SOPS field expeditions helped to determine the amounts of petroleum and gas underground in Azerbaijan and the Caucasus as a whole, which considerably improved the conception of the petroleum reserves of the Apsheron Peninsula, including portions of the Caspian Sea bed, where later the "Neftyanyye kamni" ["Oil Rocks"] Oil Field was created. The effectiveness of creating a northwestern center of ferrous metallurgy (Cherepovets Metallurgical Plant) using Kola iron ores, Pechora coking coals and scrap metal from the northwest of the country was substantiated.



In the subsequent period interdisciplinary field expeditions of SOPS discovered new lands in Azerbaijan and the Black Sea coast suitable for tea plantations, drafted recommendations for designing the Main Turkmen Canal, worked out measures for agricultural development of land adjoining it, and drafted recommendations for planting virgin and long-fallow land to grain crops in Northern Kazakhstan and Altayskiy Kray.

Efforts related to ensuring comprehensive development of the republics of Central Asia and Kazakhstan, including Bol'shoy Turgay, were at the same time expanded, and this promoted development of industry in that region. The major field studies were conducted by SOPS in East Siberia, as a result of which prospects were opened up for developing the fuel and iron ore resources of that extensive area (the Kansk-Achinsk, Irkutsk and Minusinsk coal basins and the Angara-Pit and Angara-Ilimsk ore basins) and the hydroelectric power of the Angara and Yenisey.

The results of research done by SOPS have been used in resolving major economic problems and have had great importance to the planning, development and location of the national economy. Ministries and departments have taken this research into account in drafting project planning and technical documentation for construction of major industrial projects in regions undergoing new economic development, local party and economic authorities have made use of it in working out measures to develop the productive forces, and divisions of USSR Gosplan have used it in preparing planning documents.

Still another major result of the work done by SOPS in those years is its participation in the founding of a number of multidisciplinary scientific research institutes and affiliates, which came into being from its field expeditions.

Another major result of SOPS' effort in these years is its participation in creating a number of interdisciplinary scientific research institutes and affiliates from its field expeditions.

By the beginning of the sixties extensive material had been assembled describing the natural and economic potential of most of the country's regions, and staffs of scientists capable of conducting independent research had been created in the regions themselves. This made it expedient to shift from studies of single regions and problems to substantiation and drafting of constructive proposals concerning all the country's regions. The best way to organize this extensive preplanning effort was in the system of USSR planning agencies.

#### SOPS in the System of USSR Gosplan

SOPS' move in June 1960 into the system of planning agencies set new tasks for the staff of scientists, and within that staff subdivisions were created for regions, for sectors and also for the economy as a whole. The

principal task of the council was now to prepare preplanning scientific materials on the country's future regional economic development, above all master schemes of location of the productive forces.

The principal purpose of the master scheme is to furnish the central planning agency a thorough analysis of development of the various sectors of social production in a regional breakdown, to discover the constructive and adverse tendencies which have taken shape in the country's economy and in each of its regions, to substantiate proposals for efficient development of the national economy and of its regional structure in the future. The master scheme is a summary preplanning document concerning the regional structure of the national economy, and it includes definition of the most effective strategies for regional development of physical production and the shaping of the economic complex of regions in close linkage with the resource base--labor, mineral raw materials, fuel and power, timber, land, water, and operative fixed productive and nonproduction capital.

Such a scheme was first prepared for the 1971-1980 period. SOPS began the work to devise it in accordance with the Directives of the 23d CPSU Congress Concerning the Five-Year Plan for Development of the USSR National Economy in the Period 1966-1970. The general method of drafting the Master Scheme for Location of the Productive Forces of the USSR in the Period 1971-1980, which was developed by specialists of SOPS, has become an important instrument in this work. It has been mainly used in the further work on the master scheme. The coordinating plan compiled at that time was the first experiment concerning this subject matter to unify all the country's scientific potential in preparing preplanning material. In the period of drafting the first master chart SOPS held scientific-practical conferences in most of the major economic regions and union republics; the prospects for development and location of their productive forces were examined in every aspect at those conferences. Recommendations of those conferences, in whose proceedings the country's leading scientists and officials of ministries and departments, planning agencies and local party and soviet organizations took an active part, were used in the master scheme.

This method of organizing the effort was further developed in SOPS' compilation of the Master Scheme for Location of the Productive Forces of the USSR in the Period 1976-1990. Examination of its sections by divisions of USSR Gosplan, in sessions of the section for regional problems of location of the productive forces of the Council of USSR Gosplan for Major Social and Economic Problems, and in the State Commission for Expert Evaluation of USSR Gosplan and the approval of the scheme's basic propositions by USSR Gosplan had particular importance.

The master scheme covering the 1976-1990 period consists of the following principal sections:

1. general economic problems of the location of the productive forces (analysis of the contemporary location of the productive forces, forecasts

of regional proportions of the national economy, of population, of labor resources and employment, of formation of the system of population distribution, and of the rising standard of living of the population by regions of the country);

ii. schemes of location of the sectors of the economy taking into account the regional aspect of scientific-technical progress;

iii. schemes for comprehensive development and location of the productive forces of the union republics and economic regions of the USSR;

iv. international division of labor and its influence on location of the productive forces of the USSR;

v. economic efficiency of location of the productive forces;

vi. schemes for the most important regional national economic complexes and regional industrial complexes.

The master scheme for location of the productive forces makes provision for the following:

a. more extensive inclusion of fuel and power, raw materials and water resources of the country's eastern regions in economic flows; creation of large new fuel and power centers on the basis of those resources and formation of complexes of energy-intensive operations in ferrous and nonferrous metallurgy, the chemical industry, the pulp and paper industry, the microbiological industry and other industries;

b. further improvement of the economic structure of the European regions of the USSR mainly on the basis of retooling and reconstruction of existing enterprises, with thoroughgoing restriction of new construction and expansion of energy-intensive and water-intensive production operations;

c. a system of measures for the most efficient supply of fuel and electric power to the national economy of the European part of the country and the Urals;

d. construction of new machinebuilding complexes and enterprises in the country's economic regions in accordance with their economic configuration;

e. expansion of the production of nontransportable products in the zones and areas of their greatest consumption;

f. location of production so as to take into account regional differences in the formation of labor resources, their more complete employment in the national economy, especially the rapidly growing labor resources of Central Asia as well as Azerbaijan SSR;

g. strategies for solving regional social problems, for equalizing the standard of living from region to region and between urban and rural areas, stabilization of the work force in newly developed regions and in rural localities of regions with a manpower shortage, and improvement of the population distribution;

h. more elaborate specialization and a higher level of integration in development of the union republics and the country's economic regions;

i. formation and development of regional industrial complexes (TPK's), above all in West and East Siberia, Kazakhstan, Central Asia and in the area of the KMA [Kursk Magnetic Anomaly].

The experiment in drafting the master schemes of location of the country's productive forces as preplanning scientific-practical documents has won recognition not only in the USSR, but also in the other socialist countries.

Along with drawing up the master schemes, SOPS has been working constantly on regional economic research and development of schemes for formation and development of the most important individual TPK's.

As a progressive form of regional organization of socialist production, the TPK's organically unify development of sectors and industries representing specialization at the national level with optimum formation of auxiliary and supporting production operations and the production and social infrastructure, and they solve problems of the location of production and population distribution in relation to one another. The economic and social aspect of the TPK is provided for by approaching the opening up and development of a specific region as a subsystem of the unified national economic complex.

As early as the 1966-1970 period SOPS organized research on the formation and development of a number of TPK's. The problems of creating them were broadly discussed in scientific-technical conferences. For example, the Tyumen' (1969) and Tomsk (1968) conferences, which thoroughly examined the problems of developing the regions of the West Siberian Plain, were held on the problems of West Siberia. The papers delivered by the scientists, heads of ministries and departments and secretaries of party obkoms contained valuable recommendations that made it possible to determine with sufficient confidence the possible rates and levels of petroleum and gas production for 1980. In 1975 and 1976 schemes were worked out for the formation and future development of the system of Angara-Yenisey, Southern Tadzhik, Southern Yakutia and other TPK's.

At the same time SOPS' staff of scientists has prepared a number of substantial scientific-practical reports for USSR Gosplan on urgent problems in the regional organization of the country's national economy--on the main lines of long-range comprehensive economic and social development of Siberia



and the Far East, on optimum utilization of labor resources, on substantiation of the location of a number of major industrial projects, etc.

The materials and recommendations drafted by SOPS have been used by USSR Gosplan in preparing decisions for construction of major machinebuilding complexes, including KamAZ [Kama Motor Vehicle Plant], VAZ [Volga Motor Vehicle Plant], Atomash [enterprise specializing in manufacture of nuclear power plant equipment], etc., and on development of the productive forces of Krasnoyarskiy Kray, the Far East, Yakutskaya ASSR and certain other regions.

Projects in which work was done on the problems of location and regional economics coordinated by SOPS have involved more than 600 scientific, project planning and other organizations of the USSR Academy of Sciences, and gosplans and academies of sciences of the union republics, and ministries and departments. This work was done jointly with the scientific council of the USSR Academy of Sciences on the problem "Location of the Productive Forces in the USSR." All-union conferences and the Central Asian, Transcaucasus and Baltic regional commissions, which unify the resources of local scientific bodies and subdivisions of SOPS, are used to accomplish coordination.

In 1978 the SOPS Scientific Session on Problems of Scientific Methods Related to Location and Regional Economics, in which more than 200 of the country's scientific organizations took part, was held in 1978. Its sessions examined the results of research and did constructive work to coordinate research on the problems of location of production and regional economics. In view of the need for unified approaches as to the method of studying the problems of location of the productive forces by the numerous staffs of scientists, SOPS carries on regular activity concerning the methods appropriate to these topics.

The results of foreign regional economic research, above all on the theory and practice of the location of the productive forces, shaping the population distribution and infrastructure, and application of the methods of mathematical economics in solving problems of location are constantly studied in SOPS. SOPS' active participation in conferences of the scientists of the socialist countries, which are regularly convened in them on a rotating basis, has become an effective form of mutual exchange of experience and of international coordination of scientific research work. The Soviet experience in theoretical substantiation and methods preparation of the master schemes for location of the productive forces of the USSR has also been studied at these conferences. Preparation of master schemes of location to take this into account is now also under way in a number of socialist countries (Bulgaria, GDR, Mongolia, and Cuba). The SOPS staff has extended a great deal of help to the scientists of Mongolia in drafting the Master Scheme for Development and Location of the Productive Forces of the Mongolian People's Republic over the period up to the year 1990, which was approved in July 1980 by the Mongolian State Planning Commission.

At the same time the council has been implementing bilateral agreements on scientific-technical cooperation with institutes of the state planning commissions of Bulgaria, Hungary, GDR, Mongolia and Cuba; this is being done by holding symposiums, through mutual consultations, and by publishing joint scientific works.

SOPS is doing a great deal of work to train scientists. Between 1971 and 1980 180 candidates of science were trained in its graduate program, and 16 persons defended doctoral dissertations in SOPS. They are all working productively in many scientific research organizations of the country, in party entities, and on the staff of USSR Gosplan and the gosplans of the union republics.

#### Main Directions in SOPS' Future Activity

In discussing SOPS' activity, we cannot but note substantial shortcomings as well. First among them is that research on methodology and methods has not been strong enough. For instance, the drafting of the method for determining the economic efficiency of location of industrial enterprises and for formation and development of regional industrial complexes has dragged on for many years. This has had an effect on the soundness of work done and proposals made concerning these programs both within SOPS and also in sectoral and regional institutes. For the same reason the version of methods guidelines for compilation of sectoral and regional schemes, which was prepared by SOPS, had to be thoroughly redone in USSR Gosplan.

The quality of a number of projects performed is diminished because the authors are not uncommonly restricted solely to the use of materials of planning and economic agencies. In view of the large increase in the number of staff members (an increase of more than 40 percent between 1960 and 1980) scientific efforts are not at present concentrated on the main lines of SOPS' work. There are many shortcomings in the work with organizations with which joint projects are being conducted.

They must, of course, be overcome, and this must be done as rapidly as possible. But the main thing is to bring the activity of SOPS closer to the demands of planning practice. This requirement has been imposed by life itself, and it derives from the need to ensure successful performance of the tasks set by the CPSU related to strengthening the scientific soundness of our plans.

On the basis of the fundamental principles expressed above, the main lines of SOPS' activity in the coming period can be outlined.

The most important of these lines is work on the long-range strategic problems of location of the productive forces. On the basis of the Comprehensive Program of Scientific-Technical Progress up to the Year 2000, which was prepared by our scientists, SOPS is to draft the master scheme for location of the productive forces of the USSR over that same period; it will

contain a scientific forecast both of location of the principal sectors of the national economy and also an interlink forecast of the development and location of the productive forces of the union republics and economic regions. Particular attention is to be paid to priority regions and sectors, on which successful performance of nationwide tasks depends above all. It is important that the new master scheme be drafted at a high level of scientific method, using the system of time-tested technical-and-economic indicators, modeling and the other most up-to-date methods.

At the same time a greater effort is to be made toward implementing the recommendations contained in the master scheme up to 1990 compiled previously. We are referring to specific recommendations concerning the 11th Five-Year Plan and then for the 12th Five-Year Plan as well. These proposals should be based on optimization computations, and extensive use should be made of the methods of mathematical economics and computer equipment and techniques.

Improvement of the method of compiling the general schemes and of systematic analysis of progress in their fulfillment will make it possible on the one hand to increase the economic soundness of the solutions and recommendations proposed for location of the sectors of the economy and major projects and development of individual regions, but on the other to discover in good time regional disproportions and shortcomings in location as they become evident and to outline ways of overcoming them.

The target-program method is a promising direction for planning. In addition to scientific-technical, economic and social programs, regional programs will also be drafted for particular regions and for regional industrial complexes. The drafting of such programs of nationwide importance will occupy an important place in the work of SOPS. We should emphasize that they must differ qualitatively from schemes compiled previously, must be more specific, and must specifically assign the tasks they consist of so that in future they become an integral part of multiannual state plans. The first programs of this type--for the BAM (Baykal-Amur Main Rail Line) and for Northwest Siberia--are already taking shape.

In addition to these directions, it seems indispensable to organize in SOPS more thorough work on the problems of the theory and practice of planning the location of the productive forces and the regional economy, including the system of economic incentives and penalties. The principal reference is to location of energy-intensive production operations in the country's eastern regions and restriction of further concentration of industry in large cities. This makes it an urgent matter to radically bolster work being done on the theory and method of the economic planning of the union republics and economic regions, i.e., of regional planning in the strict sense.

In view of the growing importance of the problems of optimum regional organization of the national economy, SOPS is also becoming more important as



the head all-union center for the problems of location of the productive forces and regional economics. In the half a century of its existence scientists of the council have made a large contribution to the study of those problems, scientific traditions have been shaped, and highly qualified personnel are now at work--these are the most important objective preconditions for its successive efforts in the future.

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## INTRODUCTION OF NEW TECHNOLOGY

### MEASURES EXPEDITING NEW TECHNOLOGICAL ADVANCES PROPOSED

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[Article by V. Babak, candidate of economic sciences, V. Logachev and V. Dvoryashin: "The Shortest Road for Hastening Development of New Technology"]

[Text] Shortening the time it takes to perform R&D projects is one of the principal conditions for speeding up industrial application of the advances of scientific-technical progress. Working out standards of R&D time and cost has an important place in solving this problem.

The importance of standards concerning R&D time and cost is increasing because the size of expenditures for these projects must be set forth in 5-year plans (in a breakdown by years) in percentages of the total output of the sector or industry (normative net output or commodity output), and the wage fund of scientists must be set forth in percentages of the total outlays for R&D. In our view it is indispensable to take the following circumstances into account if establishing the functional relationship between the size of a sector's output, its amount of R&D and its wage fund is to help shorten project time.

First of all, the total amount of R&D which is planned for the particular sector includes both projects performed for the given sector and also intersector projects, the most important of which are carried out in cooperation with NII's [scientific research institute] and KB's [design bureau] of other sectors in accordance with comprehensive programs. Since the amount of R&D is made dependent upon the growth of the given sector's output, ministries are motivated more strongly to first include projects confined to the sector at the expense of intersector projects, whose project times may accordingly increase unjustifiably. If development of cost accounting (khozraschet) within sectors is not to hold back introduction of the target-program method of planning and managing scientific-technical progress, it would be wise for intersector projects to be given separately from the total volume of R&D to be performed by the sector's NII and KB and for them to be financed on a priority basis with budget appropriations.

Second, R&D is having an effect on the process of specialization and cooperation within the sphere of scientific-technical progress, which has intensified in recent years. This is the principal reason why in many sectors the ratio of wages to outlays for R&D is dropping while at the same time there is a considerable increase in the amount of R&D work being done by outside organizations and enterprises.

For instance, in the electrical equipment industry the actual outlays for R&D increased 119.6 percent over 10 years, and wages only 68.6 percent, while at the same time expenditures to pay for projects performed by outside organizations and enterprises increased more than sixfold. As a result the relative share of wages in outlays for R&D dropped in that period from 40.4 percent to 30.5 percent, and the proportion of payments for projects of outside organizations increased from 13.3 to 37.2 percent. It is important to note that over the 10 years there was a saving on wages every year, whereas in payment for projects of outside organizations the actual costs exceeded those envisaged by the plan and the cost estimate by between 27 and 122.4 percent. Consequently, the saving on the wage fund was not achieved by raising labor productivity, but by transferring a portion of the projects to other organizations, and actually it was entirely absorbed by the higher expenditures for wages in those organizations. We therefore consider it indispensable to introduce for NII's and KB's an indicator of the projects performed and completed within the sector. Then planning the wage fund and monitoring its optimum use would promote a rise of labor productivity by personnel of NII's and KB's and earlier completion of projects.

From industry to industry there is a very wide variation in the relative proportions between NII's and KB's, in the productive capability of both, and also in the number of leading and specialized scientific organizations, and this does not always correspond to the needs of the industry by any means. Often a justified increase in the number of leading institutes (for example, from 18 to 22 in the Ministry of the Electrical Equipment Industry), resulting from expansion of the lines of the industry's technical development, is accompanied by an overall increase in the number of NII's and KB's, which is not conducive to the pooling of resources and reduction of R&D time. In machinebuilding there is an inadequacy of mechanical engineering and process engineering development projects, which is holding up timely completion of projects on which the applied research has been done.

The number of scientific organizations and their distribution by types vary greatly, they change from year to year, new organizations are created, and there is practically no system of management making it possible to determine the interrelationship between them and the place which each has in solving the problems of raising the technical level of production and product quality. At present specialization and cooperation in scientific work is becoming more elaborate, but unfortunately it is not always accompanied by a concentration of efforts, and there is an increase in the number of small scientific organizations. For instance, in the 3 years of the 10th



Five-Year Plan the number of NII's and KB's in the Ministry of the Electrical Equipment Industry increased by nearly 15 percent, while the amount of R&D performed increased only 12 percent on the basis of estimated cost and 15 percent on the basis of actual cost, and the amount completed and delivered to the ministry and to clients increased only 4 percent. As a consequence the number of projects performed during the year per organization did not increase, and the number delivered dropped 10 percent. The number of scientific organizations is also increasing in the Ministry of Machine-building for Light and Food Industry and Household Appliances, the Ministry of Automotive Industry and a number of other sectors and industries.

Small organizations which undertake major topics jointly drag out project completion time, and as a consequence work in process in the leading institutes is increasing. Work in process of NII's and KB's in a number of sectors and industries is already approaching the amount of work completed in 2 years, and in certain institutes it exceeds that figure. For instance, at the end of 1978 it reached 178 percent of the annual amount of work in the Ministry of Electrical Equipment Industry, whereas at the end of 1969 it exceeded it by only 5 percent. Over the 10 years the annual amount of R&D performed increased 2.1-fold, but work in process 3.5-fold. Moreover, the relative share of work in process consisting of projects financed from the YeFRNT [Unified Fund for Development of Science and Technology] increased from 32.3 percent as of 1 January 1969 to 59.4 percent as of 1 January 1979, and it increased correspondingly on projects performed on the basis of contracts with clients.

The reason for this situation is that the new technology and processes are constantly becoming more complicated, so that it is costing more time and money to develop them and put them into production. This applies above all to projects performed under the state plan and the plan of the ministry and financed from the YeFRNT. In view of this fact in the Ministry of Electrical Equipment Industry they annually plan faster growth rates of R&D financed from the YeFRNT, and the share of such projects in the plans of the industry's NII's and KB's increased correspondingly. As a result the amount of work financed from the YeFRNT in the R&D plan for 1978 was 2.9-fold greater than in the plan for 1969, and the amount of work for clients increased 1.7-fold, and the relative share of the former was 62 percent, as against 49 percent, on the basis of estimated project cost.

Thus the policy of a planned relative reduction in the amount of R&D performed under contracts with clients in order to concentrate the energies of NII's and KB's on projects financed from the YeFRNT and in order to guarantee their speedy completion can be clearly traced in this industry.

But fulfillment of plans for these two types of projects has varied: whereas plans for projects performed for clients have been considerably overfulfilled every year and the number of projects completed has exceeded the number planned, in the case of projects financed from the YeFRNT plans were overfulfilled only up until 1973 (and to a considerably smaller extent

than for projects done on contract), while thereafter they were not fulfilled. Matters stand even worse with completion and delivery of projects financed from the YeFRNT, which in every one of the 10 years was considerably below both the plan and their actual performance. As a consequence the volume of completed YeFRNT-financed projects increased less than 2.7-fold between 1969 and 1978, but work in process increased more than 5.2-fold. Work in process also increased for contract projects, even though delivery of these projects has annually exceeded the planned amount of R&D because of substantial overfulfillment of the plan.

In our opinion this situation came about, first, because of the definite discrepancy between the capability of those performing R&D projects jointly under a single job order, as we noted above, which tends to hold up completion of projects by the head institutes.

Second, in many organizations the number of projects being carried on at the same time is increasing, which does not contribute to concentration of personnel and resources and to reduction of R&D time. In the All-Union Scientific Research Institute for Electrothermal Equipment during the first 4 years of the 10th Five-Year Plan the number of projects being performed during the year increased 1.5-fold, while the amount of work being done increased 18 percent on the basis of estimated cost and 22 percent on the basis of actual cost. Performance of projects by this organization's own personnel has been lagging behind the increase in the total amount of R&D, and as a consequence the proportion of these projects dropped from 73 percent in 1976 to 69 percent in 1979 on the basis of estimated cost, and still more, from 72 percent to 67 percent, on the basis of actual cost.

Third, during the year changes are made quite often in the topic plans of NII's and KB's both because of shortcomings in material and technical supply and also on the basis of other reasons, so that later one and the same topic is carried over from the plan for one year to the next, and the costs of performing the project increase; not uncommonly projects are terminated, the expenditures are actually declared to be worthless, but they are not immediately written off by any means, and for a long time they are included in work in process. In 1978 in the Ministry of Electrical Equipment Industry a relatively large amount of expenditures were written off on projects terminated and discontinued which were being financed from the YeFRNT, though in the 1969-1977 period this figure was negligible. At the same time on projects for clients these write-offs were made twice: in 1974--nearly 2 percent of the volume of work delivered and in 1977--approximately 1.6 percent. Over the entire 1969-1978 period the costs of projects terminated for clients exceeded almost threefold those for projects financed from the YeFRNT. Since over the entire 10-year period the relative share of expenditures for projects performed under contracts and delivered to clients is approximately 55 percent, we can conclude that a sizable amount of expenditure to be written off on projects that have been terminated and discontinued have accumulated in work in process on projects financed from the YeFRNT.

Fourth, projects done under contracts with clients are more profitable, so that NII's and KB's try first to complete a large amount of these projects and to increase their number. One consequence of this is that project time becomes longer for YeFRNT-financed projects, and another is that project time increases for client-financed projects, since the organizations take on a great many of them and do not manage to complete them quickly.

An analysis shows that in the 1969-1978 period in the Ministry of Electrical Equipment Industry the reduction of actual costs relative to estimated costs was considerably greater on projects for clients year after year than on projects financed from the YeFRNT, and in the average for the 10-year period, the difference in the level of their costs was 5.8 percent of the estimated cost of work delivered. This resulted from the greater exactingness of the ministry toward cost estimates compiled by NII's and KB's for performance of projects and from its monitoring the level of costs and accumulation, whereas on projects for clients the estimated cost is regularly boosted up substantially, which has an adverse effect on R&D completion time. An analogous situation has come about in the Ministry of Heavy Transport Machinebuilding and the Ministry of Power Machinebuilding.

The profit of NII's and KB's is not planned, and by contrast with enterprises and other organizations (for example, project planning organizations doing projects for capital construction) their performance is not evaluated on fulfillment of the profit target, which is mainly because of the lack of a set of standards to be used in setting prices for R&D projects. The accumulation forming in NII's and KB's in the form of the difference between the estimated project cost and the actual cost of performing it, as practice has shown, often results not from a saving on funds, but from a hiking up of the estimated cost.

Since a growth of accumulation in these organizations does not by any means indicate an improvement of their performance and cannot serve as a criterion for evaluating the efficiency of the activity carried on by NII's and KB's, a procedure has now been established for revising the estimated cost of altogether completed projects, which must not exceed by more than 3 percent the actual costs of R&D projects. The difference between the original and revised estimated cost of the project is returned to the source from which these projects were financed. This procedure should have an inhibiting effect on the hiking up of project cost, especially on projects performed under contracts with clients, which makes it possible for NII's and KB's to overfulfill plans by altering the planned distribution of projects [between the two types] and to credit substantial amounts to the organization's development fund. Both the number of R&D projects and project time may be reduced as a result.

Project time and the growth of work in process have been adversely affected by the absence of standard allowances governing them and the failure to work out standards governing working capital, which up until 1977 were established only for production stocks, which comprise about 4 percent of the

sum total of working capital. The level of these allowances has had practically no influence on the financial condition of NII's and KB's. At the same time remainders of both research and development work in process, which comprise the bulk of working capital, have not been subjected to standard allowances, nor has there been any method of establishing allowances on working capital that would take into account the specific nature of the activity of sectorwide and industrywide scientific organizations.

A method of setting standard allowances on the working capital of NII's and KB's has been developed in order to shorten R&D time and reduce work in process in the electrical equipment industry. It made provision for a certain reduction of actual remainders of working capital, and detailed computations of standards governing working capital in the form of work in process are given separately for projects financed from the YeFRNT, for job orders of leading organizations, and for contracts with clients within the sector or industry and clients of other ministries and departments. Coefficients of the variation of actual remainders of work in process are established for each of these types of projects, and they are applied as follows: if the average annual remainder of work in process does not exceed 100 percent of the planned volume of work, the coefficient is equal to unity; when the level of the remainder is between 101 and 125 percent, the coefficient is 0.99; between 126 and 150 percent it is 0.97, and above 150 percent 0.001 is added to the coefficient 0.97 for each additional percentage point.

Adoption of this kind of norm setting will in our view hardly have an essential effect toward reduction of the needs of NII's and KB's for working capital. In our opinion setting sound standard allowances on work in process of NII's and KB's requires either a one-time radical restructuring of the planning of R&D by reducing project time and concentrating energy on a limited number of the most important development projects or an annual reduction of the volume of work in process on the basis of altogether definite benchmarks established on the basis of progressive standards pertaining to project time, project cost and the number of R&D projects being carried on simultaneously, and these would figure as targets to be attained during the period for which they are assigned. But this method is not aimed at a radical restructuring of the activity of the NII and KB of the sector or industry; its development should be regarded only as a developmental stage in setting standards governing working capital of these organizations.

The effectiveness of economic levers and incentives in the R&D field depend in our opinion on the extent to which their application is linked to improvement of the system of management of scientific-technical progress in sectors and industries, to optimization of research and development projects and to reduction of project time, and to assignment of standards for each type of project and project phase. It is important to emphasize that long R&D project time often nullifies many years of efforts by large staffs of developers, since the engineering and technology they create turn out to



be obsolescent for practical purposes. That is why sectorwide standards governing performance of applied research and development projects must be optimal.

It is moreover impermissible to artificially fragment projects; times must be shortened and optimized by concentrating the important efforts of developers on a limited number of major interdisciplinary projects. Setting standard R&D project times and planning the amount of necessary work on that basis will tend to optimize the network of NII's and KB's in sectors and industries and will create the conditions for their consolidation and greater mobility in carrying out projects. Then sound standard allowances governing their working capital can be introduced and these organizations can be allotted their own working capital. It would seem that after optimization of project completion time and after steps are taken to improve project planning and a uniform pace in project performance and the transition is made to settlement for projects altogether completed it will be sufficient for sectorwide and industrywide NII's and KB's to be allocated their own working capital in the proportion of 10 percent of the annual amount of R&D work so that the remaining amount would be performed on the basis of bank credit extended not on the basis of the plan, but on the basis of the amount of work actually performed and the planned completion dates. The amounts of credit should be determined and extended to NII's and KB's so as to take into account the amount of "own" working capital they have.

The proposal we have advanced is confirmed by the experience of project planning and surveying organizations, which were converted at the very beginning of the Ninth Five-Year Plan to settlement for finished work and phases of work. In the process of administering this kind of settlement it has become more and more common practice to make payment for finished project plans, surveys, blueprints and other types of completed work items. The share of this kind of settlement for the finished product delivered to clients in Khar'kovskaya Oblast by 40 project planning organizations of Khar'kov have reached 70 percent over the last 5 years. Thanks to the improved organization and shorter project performance time there has been a sharp reduction in the amount of work in process, which in the Eighth Five-Year Plan reached 50 percent of the annual volume of work done. During the 1973-1978 period work in process at the end of each year comprised 12.3-13.5 percent of the work done in a year, and the standard allowance governing "own" working capital to cover those expenditures, which had been set at the level of 15 percent of the annual volume of work, proved to be too high.

A similar situation also came about in industrywide project planning organizations of six machinebuilding ministries (Ministry of Electrical Equipment Industry, Ministry of Instrumentmaking, Automation Equipment and Control Systems, Ministry of Machine Tool and Tool Building Industry, Ministry of Machinebuilding for Light and Food Industry and Household Appliances, Ministry of Chemical and Petroleum Machinebuilding, and Ministry of

Automotive Industry). When the transition was made to settlement for the completed product of project planning and for phases of work, work in process at first increased somewhat, but then during the 10th Five-Year Plan it began to drop, and by the outset of 1979 it was 9.3-15.1 percent of the amount of project planning and surveying work done during 1978. It is significant that the dynamic behavior of "own" working capital in these project planning organizations corresponded to variation in the volume of project planning work in process, and in recent years the need for working capital has assumed a steady declining trend. The industrywide project planning organizations regularly use bank credit to cover the costs of work in process and borrow against payment documents en route. There is no question that the credit and settlement procedures have tended here to reduce project time and diminish work in process.

Development of pilot and experimental production facilities has great importance to shortening R&D time along with creation of an optimum network of scientific research, mechanical engineering and process engineering organizations, a network that ensures their economically sound cooperation and the simultaneous and parallel performance of the various stages of major projects in short periods of time. It is important that the activation of pilot production operations be speeded up and that they be furnished up-to-date equipment and instruments; to reduce the number of developments assigned to the pilot facility by consolidating the topics of head scientific research institutes and scientific-production associations. There is also a need to relieve pilot plants from filling orders which are not in line with their tasks, in particular to manufacture series-produced products. To this end it is advisable to make them subordinate to head institutes of the respective configuration and to establish indicators for evaluating their performance, which should in turn be based on assignments for developing highly efficient new types of engineering and technology, for putting them into production and for applying them in short periods of time.

If NII's and KB's are to participate more actively in putting their developments into production and in the rapid growth of output, it would in our view be advisable to include in costs and stimulate not only performance of R&D itself, but also the performance of such operations as readying the new equipment and processes at enterprises; adjustment and assistance in putting it into production; helping the consumers of the equipment to set it up, to test it and to put it into operation and the organization and expansion of series production. Finally, a differentiated approach is needed here that takes into account the peculiarities of every sector and industry and the condition of the production operation in which scientific developments are being introduced and its technical level and the skills of its personnel. In particular, helping consumers of new technology to set it up, to test it and to put into operation is furnished in most sectors and industries by specialized adjusting organizations, and in some by pilot and experimental plants. But the need for personnel of NII's and KB's to participate in performing these operations, which is conducive to their speediest completion, often does arise, and it must be quickly met.

Recently there has been an increase in the number of enterprises and organizations which have substantially reduced the time for application of new engineering and technology by increasing the efficiency of management of production and thanks to help from personnel of NII's and KB's. In NIOKhIM [Scientific Research Institute of Heavy Chemistry], for example, there are specialized industrial application teams consisting of researchers, designers and specialists of industrial enterprises, and standards have been set up for fulfillment of projects in accordance with the institute's project plan. This has made it possible to reduce the time for industrial application of developments to less than half.

In the VNPO [All-Union Scientific-Production Association] Soyuzgazavtomatika abundant experience has been gathered over the last 8 years in organizing mixed innovative teams consisting of all participants in the "research--production" cycle and delivering the completed product to the client in a short period of time. R&D time is being reduced because all the teams engaged in creating a new prototype of technology work concurrently from commencement of design work on the idea to its application. The teams are organizationally interconnected by a network schedule. Relations with joint participants in the project are regulated by contract. Under these conditions it is possible to organize planning of the process of creating new technology from start to finish. Efficiency of utilization of resources is improved because they are redistributed in good time over all the stages of the "research--production" cycle, whose length is consequently reduced to less than half.

The experience of the VNPO Soyuzgazavtomatika is now being applied more and more widely in the industry not only to speed up the process of applying single prototypes of new technology, but also to resolve major scientific-technical problems arising in the various industrial complexes. In the latter case creation of interdisciplinary innovative teams is a fundamentally new organizational form. For example, in doing the work to fully mechanize the Krestishchenskoye gas deposit, one of the largest in the Ukraine, an innovative team was set up consisting of highly qualified specialists of the Khar'kov Gas Industry Administration, the VPO [All-Union Production Association] Ukgazprom, the VNPO Soyuzgazavtomatika, the project planning institute Yuzhniigiprogaz, the special project planning and design office for industrial automation SPKBPromavtomatika, etc. The new form for organizing the work of specialists of two ministries (USSR Ministry of Gas Industry and Ministry of Instrumentmaking, Automation Equipment and Control Systems) made it possible in 1979 to solve complicated organizational and scientific-technical problems pertaining to speeding up automation and introduction of remote control of installations for multiple preparation of gas by using new instruments and automatic systems and by rebuilding local automatic control and process monitoring systems.

The methods of organizing projects are the same as in the context of the NPO. After the survey of the overall situation as to the level of automation the team outlines the necessary amount of R&D work, the output of the

intended set of technological equipment, and the dates for installation and adjustment work. In conferences held at least twice a quarter which are attended by all representatives a detailed analysis is made of progress in performance of the work, and adjustments are made in the plans and schedules of the work of application.

Particular attention should be paid to the fact that use of interdisciplinary innovative teams makes it possible in a short time to apply prototypes of equipment that are new to the industry and manufacturing processes whose application radically alters the traditional engineering and technology. As a result not only is the time for solving the scientific-technical problem reduced, but production efficiency is raised considerably, product quality is improved, and reliability of equipment operation is increased.

There has also been interesting experience in reducing the time for application of new technology in other industries. For instance, at the Minsk Electrical Equipment Plant imeni B. I. Kozlov, where the application of scientific developments is planned from start to finish, completion was speeded up 1.5-fold, and the economic benefit was nearly doubled. It took the NPO Tulachermet less than 4 years to create the world's largest ferrovanadium plant from the semi-industrial tests to attainment of the complex' design performance. It took 2 years to manufacture a horizontal machine for pouring steel and for intermediate construction of a pilot industrial installation. Thanks to thorough experimental work and reduction of the intermediate stages the equipment for spraying liquid metal was designed, manufactured and released in 8 months, i.e., in barely one-fourth of the time which is the average for the country.

Reduction of the time for application of innovations in associations and enterprises has been achieved by taking various managerial steps, as follows:

- i. creation of scientific-production complexes within associations, which as a rule have an advanced pilot facility;
- ii. organization of innovative groups (teams) both within the association and also intersector teams, including not only representatives of the manufacturing plant, but also developers of mechanical designs and processes, and clients;
- iii. development of a comprehensive product quality control system, usually by adopting standards and by using standard components and assemblies in new mechanical designs and processes. These systems essentially represent long-range programs for development of the production of specific types of products;
- iv. adoption of computerized systems for management of production and the drafting of standards regulating the principal managerial functions of subdivisions.



These managerial measures are in our opinion the basic organizational methods of reducing R&D time and increasing the economic benefit from applying prototypes of new technology. An especially efficient managerial form is to organize interdisciplinary innovative teams, which make it possible to use the target-program method in solving scientific-technical problems, to practice start-to-finish continuous planning of the process of creating and applying new technology, and to substantially improve production efficiency thanks to faster assimilation of fundamentally new and promising scientific developments, which largely determine the level of an industry's development.

Project planning organizations should perform the important task of ensuring a close interrelationship between the results of scientific research and capital investments. This interrelationship is very slack at the present time. Project planning and surveying organizations gravitate toward capital construction, and NII's and KB's gravitate toward the principal production. It has obviously become high time to do comprehensive work on the question of the capital investment process as a single process whereby the advances of science and technology are transformed by means of capital investments into productive capital, and also to improve management of both science and also capital construction. It is important to ensure a certain synchronization in the development of these spheres of activity, which would create conditions for rapid realization of technical innovations in expanded socialist reproduction.

The question of the close interrelationship between the scientific-technical programs and capital construction is especially acute. Since approximately 0.4 percent of the total volume of capital investments will be needed to carry out such programs planned for the 10th Five-Year Plan, in many cases deadlines for setting up installations to work on new equipment and technology are missed not because of difficulties in allocation of resources, but because the plans of capital construction are not linked to the plans of scientific-technical progress.

The number of projects which need to be activated under scientific-technical programs nearly doubled between 1978 and the 1979-1980 period. The lists of projects to be activated under these programs have been communicated in advance by the USSR State Committee for Science and Technology to ministries and departments so that they could be included in capital construction plans and the necessary resources provided for. But material-technical and financial resources are not always allocated on time and in full amount. This tends to prolong manufacture of experimental prototypes of new equipment and technology as well as their being put into production.

The relationship between the volume of completed scientific-technical developments and the capabilities of production to put them into production and to apply them should also be optimized. It is very important in this connection to adopt one and the same planning indicator for NII's, KB's and industrial enterprises, in accordance with the decree of the CPSU Central Committee and USSR Council of Ministers dated 12 July 1979.

Organization of recordkeeping on completed developments which have not been applied has an important role. This kind of recordkeeping has not existed in sectors and industries up to now; developments completed by NII's and KB's are paid for from the YeFRNT, but not uncommonly they are not used in production for a long time. As a result many of them have become obsolescent, and the expenditures become a waste, but because these developments were never recorded anywhere, neither the ministry nor the industrial association bears responsibility for them. That is why it is advisable to reflect completed developments in the records of the ministry, since in possession of that kind of information it can plan the sector's or industry's future technical development. These are in our opinion some of the ways of improving scientific research and development and of reducing the time for application of new technology.

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